not only of scientists, but of all hu-

surface of Mars is thought to be cut by

much for the value of measuring

One part of the complete mechanism

for measuring star heat is a water cell, through which

Elimination of the light of the Invisible Rays. order to eliminate certain of the invisible rays. In the

part of the mechanism Mr. Coblentze found that if instead of a square cell

copper chloride was used, a large numper of the invisible rays of the spec-

trum are eliminated. About that time

paratus wrote to the bureau of stand

a cell by which the film could be more

effectively protected from the heat of

the arc light than by an ordinary water

the arc light than by an ordinary water cell. Mr. Coblentze was able to tell him about the use of the copper chloride solution. By placing a cell containing this solution between the film and the light which throws the picture on the screen it is possible to eliminate the heat of some of the invisible rays without losing the light from the visible ones. Thus did the movies get a boost from the measurement of starlight.

Although the mechanism of this in-

ment of starlight.

Although the mechanism of this instrument is almost inconceivably delicate, the basic principle of it is quite simple and comprehensible to any one who understands the fundamentals of electricity. The vital part of the instrument consists in two very delicate wires of different metals, either bismuth and silver or platinum and silver, soldered together, and of a tiny, heat-absorbing surface, painted with lamp black and placed over the junction of the two wires. When this surface is exposed to heat, the two wires will generate an electrical current upon exactly the same principle as an ordi-

exactly the same principle as an ordi-nary electrical battery. The distinctive

This tiny battery is called a thermo-

by means of a tube connected with it.

and filled with metallic calcium, which

This glass cell, containing the thermoouple, is placed in the mouth of an

the great reflector of that instrument will

focus the light of the star to be observed

In order to measure the rotation of

this mirror, an ordinary scale, like a

Into Millimeters. is marked off off into milli-

meters instead of inches, is placed at

still more tiny mark. The mirror is then observed through a powerful

microscope, and the slightest deflec-tion is measured by the movement of this mark along the image of the scale.

When he had completed his instru-

ment last summer, Mr. Coblentze took

child's ruler.

has the property of absorbing all of the

constituents of the air except argon.

pass without

as Thermo-Couple.

It is well known that the

# **WILL FORCE SENATE** manity. It is well known surface of Mars is thought to be cut by immense canals, which appear to have been the work of intelligent beings, and which, if such is the case, would indicate that the Martians have carried science of engineering to a perfection which would make the achievements of the human race in that line look insignificant. The Panama canal would be as a small ditch beside the canals of Mars. It has been found that heat radiated from water will give a slightly different reaction upon a very delicate mechanism from that given by heat radiated from a solid body. In this way it is possible that the truth may be learned about he canals of Mars, and even that something may be ascertained as to the rest of its surface, which has been thought by some astronomers to be covered with red vegetation. So much for the value of measuring TO ACT ON TREATIES

Stone Says Colombia and Nicaragua Pacts Must Be Disposed of This Session.

Two treaties negotiated by the presat administration with foreign na-Colombia and Nicaragua, which have been pending before the Senate foreign relations committee for many onths, must be disposed of one way or another at the coming session of Cengress, according to Senator Stone So much for the value of measuring star heat to astronomy and science at large. And now, back to earth. The most obvious value of the invention from a utilitarian point of view lies in the fact that it is a wonderfully sensitive and accurate instrument for measuring heat. Such an instrument is called a radiation pyrometer. It is used for such ordinary and mundane purposes as measuring the heat of blast furnaces and rolling mill billets. Mr. Coblentze has primarily perfected a radiation pyrometer several hundred times as sensitive as any other, one which is capable of registering a millionth of a degree of heat, and it will have a variety of uses in the industrial world. of Missouri, chairman of the committee He indicated that the committee would asked to take action on these soon after Congress meets, and that an effort would be made as quickly as possible to get a vote on them in the Senate.

## Expects Opposition.

I expect there will be opposition to these treaties," said Senator Stone, but they must de disposed of." The treaty with Colombia contemplates paying to that nation \$25,000,000 as a balm for the loss of Panama and expressing the regret of the United States for the circumstances surround-ing the loss of Panama to Colombia. The Nicaraguan treaty calls for the payment of \$3,000,000 to Nicaragua for

payment of \$3,000,000 to Nicaragua for a canal right of way across that country, among other things.

Both treaties will be vigorously fought by republican members of the Senate. Col. Theodore Roosevelt wrote to the committee several months ago expressing a desire to be heard by the committee if the Colombian treaty was taken up for consideration. He was President at the time of the revolution in Fanama.

The committee will give Col. Roose velt a hearing in executive session if a manufacturer of moving picture ape desires to be heard," said Senator Stone. "I think that everything has ards, asking if there was any kind of been said which can be said on the

## MEASURING THE HEAT OF STARS.

By Frederic J. Haskin.

ebs and crystalline flakes, so delicate that it had to be built under a microscope, and so sensitive that with the aid a candle fifty-three miles away, and elestial bodies when their radiance is W. W. Coblentze, a scientist in the em-

Having been apprised of this fact, the

pend his time and energy measuring the heat of stars, and when the thing has human race going to derive from it?" This question has been ably answered by Mr. Coblentze himself; wherefore i will be well to set forth his answer first and then, perhaps, you will be more curious to know how the thing was done.

One naturally pictures the man who patriarchal-Spends His Time looking dreamer.

Solving Problems. a sort of modern explorer of mystical things beyond the ten of ordinary human thought. Inpractical, energetic young man, with keen

practical, energetic young man, with keen eyes and quick, nervous hands of marveious dextrity. He is not an astronomer at all, but an associated physicist, and most of his days are spent in solving questions about heat sent to the bureau by manufacturers in all parts of the country.

Mr. Coblentze answered the question as to the usefulness of his invention from both the scientific and the utilitarish point of view. His answer as a scientist was: "It goes into the big storehouse of human knowledge; no one can guess what its ultimate use may be." And he went on to explain that some years ago an astronomer had taken photometric measurements of all the stars of a certain magnitude, and with the aid of this data and his own apparatus Mr. Coblentze was able to discover that red stars are giving off from two to three times as much heat as blue ones, and are therefore burning out just that much faster. Thus, each man building upon the work of those that have sone before, science slowly explores the great unknown universe beyond the earth. Each separate achievement is only a trule, and seems an isolated and insignificant thing in itself, but it is one more link in the chain of knowledge.

The immediate use which astronomy will probably make of this invention of will probably make of this invention of Variable Stars.

of Variable Stars.

of Variable Stars.

variable stars—obstitute that the instrument may be the means of learn—

Every Woman Can Use

I use the study will be to study will be to study will be to study will probably make of this invention of the cell, and the unitermocouple of sufficient part of the cell, and the time mocouple of sufficient part of the star to be price of the time wires of the transport of the cell, and the time mocouple of sufficient part of the salar to be opported to the heat of the time mocouple of sufficient part of the salar to be observed micro-couple of the cell, and the time mocouple of sufficient part of the subject of the sufficient part of the subject of the sufficient part of th

## Can Use

And ought to use occasionally, a proper remedy for the headache, Measure Marked Off except that it backache, languor, nervousness and depression to which she may be subject. These troubles and a distance in front of the mirror, with thers are symptoms of debility a strong light upon it. In the mirror is reflected a tiny image of the scale, and upon one side of the mirror is a ligestion or constipation.

ment last summer, Mr. Coblentze took it out to California and placed it in the telescope at the famous Lick Observatory on Mount Hamilton. He made accurate, quantitative measurements of the heat of 112 celestial bodies, including 105 stars; and they were the first extensive series of such measurements of the heat all the bodily organs do their natural work without causing suffering. Every woman of the thousands who have tried them, knows that Beecham's Pills act

To Certain

ment last summer, Mr. Coblentze took it out to California and placed it in the telescope at the famous Lick Observatory on Mount Hamilton. He made accurate, quantitative measurements of the heat of placed it in the telescope at the famous Lick Observatory on Mount Hamilton. He made accurate, quantitative measurements of the heat of lit celestial bodies, including 105 stars; and they were the first extensive series of such measurements ever taken. As an example of how much heat reaches the earth from the stars, Mr. Coblentze took it out to California and placed it in the telescope at the famous Lick Observatory on Mount Hamilton. He made accurate, quantitative measurements of the heat of Place in the telescope at the famous Lick Observatory on Mount Hamilton. He made accurate, quantitative measurements of the heat of Floaristative measurements of the heat of Floaristative series of such measurements of the heat of Polaris (the north star) falling upon a surface of one square millimeter, if absorbed and conserved continuously, would require a period of 1.000,000 years to raise the temperature of one gram of water one described in the place of the heat of all the known stars were concentrated upon the same work it would take them between one and two centuries to accomplish it. The rays of the sun will do it in one minute.

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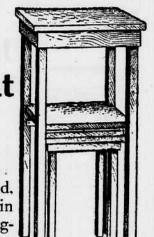
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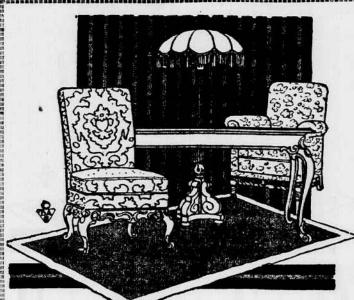
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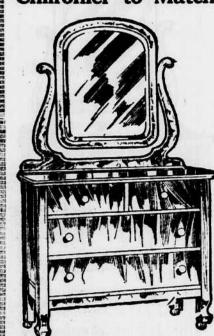
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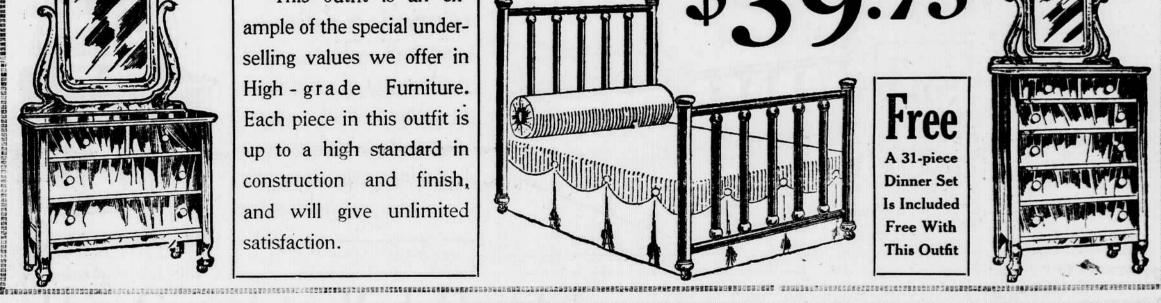
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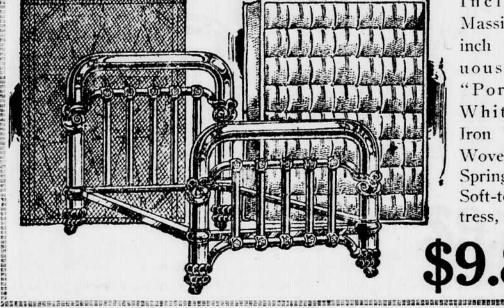
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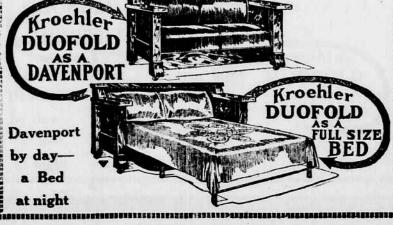
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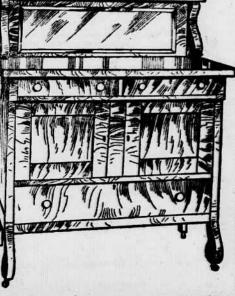
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